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CENTER FOR COMMUNITY VITALITY

# Economic Impact of a Proposed Solar Energy Project in Freeborn County, Minnesota

**A Report of the Economic Impact Analysis Program**

Presented by Brigid Tuck

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## A Report of the Economic Impact Analysis Program

April 2021

Presented by Brigid Tuck, senior economic impact analyst

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Prepared by Brigid Tuck, April 2021

# Executive Summary: Economic Impact of a Proposed Solar Energy Development Project in Freeborn County, Minnesota

During the past decade, Minnesota's electricity portfolio has changed significantly. Electricity derived from coal has fallen, and there have been rapid increases in production from natural gas and renewable energy. A variety of factors are driving this change. Among them are Minnesota's Renewable Energy Standard and decreased costs of renewable energy production.

Minnesota's power companies are increasingly investing in renewable energy development projects. One such company is Arevon. An independent global private asset management firm with a renewable energy portfolio, Arevon is proposing a large-scale solar project in Freeborn County.

Arevon is partnering with on-the-ground developer Tenaska to develop the project. The proposed renewable energy project will be 150 megawatts (MW). To develop the project, Arevon will invest $128 million in construction. Construction is scheduled to start in 2022 and operations in 2023.

As the project advances, the Albert Lea Economic Development Agency was interested in understanding the economic impact of the project in both Freeborn County and Minnesota. Thus, University of Minnesota Extension conducted an economic impact analysis. Major findings are summarized below.

## Construction

- **Direct impact:** Arevon and project partners plan to invest $128.8 million in the solar development project. Direct spending in Freeborn County is estimated to be $15.6 million. Project organizers plan to utilize 204 employees on site and pay $7.9 million in wages, salaries, and benefits to complete the work.
- **Total impact**: The development project will generate an estimated $30.9 million in economic activity during construction. This includes $13.6 million in labor income. In addition to the direct jobs, the project will support an additional 115 jobs in industries such as real estate, health care, and professional services.
- **Tax impact**: The project will generate an estimated $461,870 in state and local taxes.

## Operations and Maintenance

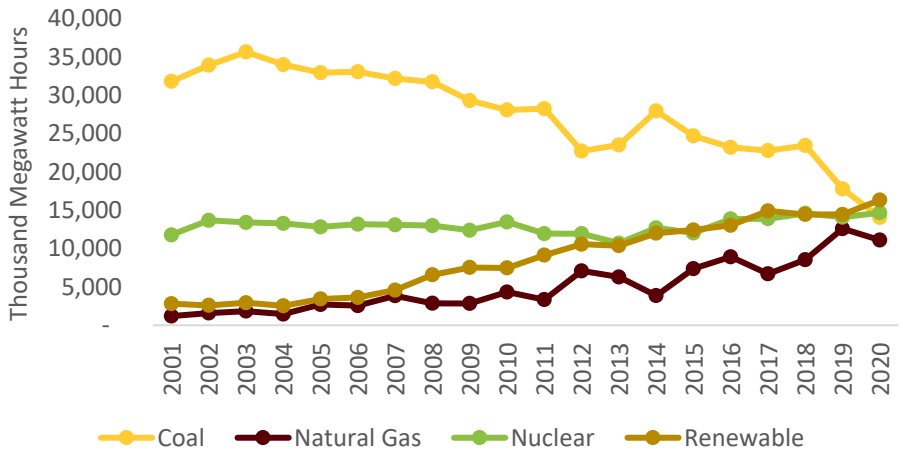
- **Direct impact:** Arevon anticipates spending $2.2 million annually on operations and maintenance. Operations and maintenance costs include payments to land owners, site maintenance, and equipment repairs and parts. The company plans on hiring four employees at the site.
- **Total impact:** Operations and maintenance of the solar project will generate an estimated $3.3 million in economic activity in the county per year. This includes $703,530 in labor income impacts. The project will support 14 jobs, four on-site and 10 in other industries across the county.
- **Tax impact:** The project will annually generate an estimated $99,040 in state and local taxes.
- These impacts will be annual, as long as the project operates at projected levels. Industries experiencing the largest economic benefit include real estate, construction, and hospitals.

## Introduction

During the past decade, Minnesota's electricity portfolio has changed significantly. Energy derived from coal has fallen, and there have been rapid increases in production from natural gas and renewable energy. A variety of factors are driving this change. First, the business and economic case for wind, solar, and energy storage has improved. In particular, costs related to wind, solar, and natural gas have decreased. Second, cities, states, and companies are increasing their commitments to renewable energy. Minnesota enacted the Renewable Energy Standard in 2007 and the Solar Energy Standard in 2013. These standards establish goals for renewable energy production from Minnesota's energy companies. Finally, many coal-fueled plants are aging and the increased costs of operating, combined with the costs of meeting environmental regulations, have made their continued operation less feasible.[1]

In response, Minnesota's power companies have increased the diversity of their energy portfolios. Production of energy generated from coal has dropped by 50 percent since 2014 (Chart 1). Meanwhile, other sources, including renewable energy, are up significantly. Nuclear production has trended slightly upward.

**Chart 1: Minnesota Electricity Generation, 2001 to 2020**

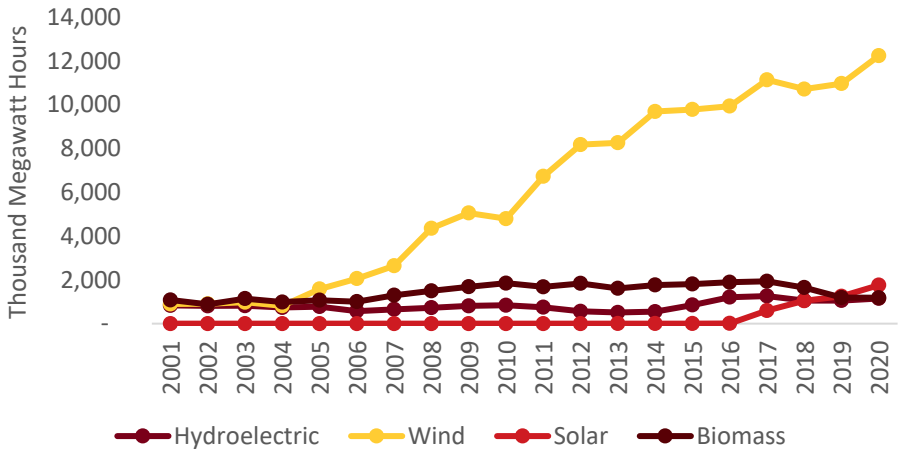



Source: U.S. Energy Information Administration

Wind energy has been a primary driver of growth in renewable energy production (Chart 2). Solar power generation, however, has grown by nearly 200 percent since 2017.

[1] https://www.house.leg.state.mn.us/hrd/pubs/genelectric.pdf

**Chart 2: Minnesota Renewable Electricity Generation, 2001-2020**




Source: U.S. Energy Information Administration

In response to these changes, power companies are investing in renewable energy development projects. One such company is Arevon. An independent global private asset management firm with a renewable energy portfolio, Arevon is proposing a large-scale solar project in Freeborn County. Arevon is partnering with on-the-ground developer Tenaska to develop the project. The proposed renewable energy project will have a capacity of 150 megawatts (MW). Arevon will invest $128 million in construction for the project. Construction is scheduled to start in 2022 with operations to begin in 2023.

As the project advances, the Albert Lea Economic Development Agency was interested in understanding the economic impact of the project in both Freeborn County and Minnesota. Thus, University of Minnesota Extension (Extension) conducted an economic impact analysis. This report presents the results.

The proposed solar development will provide two streams of economic activity. First, the project will spur economic activity during the development and construction phase. These impacts are shorter-term in nature and will dissipate once construction is completed. Second, the project will create impacts on an annual basis stemming from the operations and maintenance of the facility. These impacts will be ongoing, as long as the project operates at projected levels. Due to these differences, Extension analyzed each separately.

**Economic impact terms**

Direct effect: initial change

Indirect effect: business-to-business impacts

Induced effect: consumer-to-business impacts

Economic impact includes direct, indirect, and induced effects. Direct effect is spending by the company itself. In this analysis, it is the construction investment and the spending for operations and maintenance. To quantify the direct effects, Extension was provided with budgets for construction and operations.[2]

[2] Extension also used JEDI data on solar energy projects as a supplement to categorize major expenditures. JEDI stands for the Jobs and Economic Development Impact (JEDI) model published by the National Renewable Energy Lab.

Indirect and induced effects are also known as ripple effects. The company's spending for goods and services in their supply chain generates indirect effects. For example, during construction, the solar developer will purchase goods, such as solar components and services (e.g., engineering). Spending by the company's employees—spurred by their paychecks—generate induced effects. Workers are paid and then purchase items, such as health care, housing, and groceries.

Extension used the input-output model IMPLAN to measure the economic impact of the proposed solar project. Input-output models capture the flow of goods and services within an economy. Once the pattern is established, the model can show how a change in one area of the economy (say construction spending) affects other parts of the economy (such as manufacturing and health care).

This report highlights the economic impacts of construction activity and economic impacts of ongoing operations. The following section will discuss construction activity.

## Economic Impact of Construction

### Direct Effect

Arevon and project partners plan to invest $128.8 million in the solar development project. Of this, the majority (88 percent) will be for solar equipment and materials (Table 1). Other major expenditures include balance of plant, development, and labor. The manufacturing of solar equipment and materials is highly specialized—most of the materials needed are not produced in Freeborn County or Minnesota. Therefore, direct spending in the county or state is only a small portion of the total spending on these items.

Balance of plant activities are on-site, such as site preparation and installation of solar panels. By definition, then, all balance of plant expenditures are local. In the modeling system, labor payments are also local since the workers are on-site. Development includes expenses for items such as engineering and design and legal services. The company estimates 15 percent of these expenditures will be local.

Therefore, of the $128.8 million in total investment, an estimated $15.6 million will be directly with companies in Freeborn County and $33.8 million will be with companies in Minnesota (which includes the Freeborn County spending).

**Table 1: Direct Impact of Proposed Freeborn County Solar Energy Project, Construction, 2022-2023 (Millions)**

| | Total | Freeborn County | Minnesota (including Freeborn Co.) |
|---|---|---|---|
| Solar equipment and materials | $113.3 | $0.1 | $18.3 |
| Balance of plant | $7.3 | $7.3 | $7.3 |
| Development | $0.3 | $0.3 | $0.3 |
| Labor | $7.9 | $7.9 | $7.9 |
| **Total** | **$128.8** | **$15.6** | **$33.8** |

Source: Arevon and Extension estimates

### Total Effect

As mentioned, direct spending in Freeborn County is estimated to be $15.6 million. Arevon plans to utilize 204 construction workers and pay $7.9 million in wages, salaries, and benefits to complete the work. This is the direct effect (Table 2).

## Freeborn County Effect

In total, the development of a 150 MW solar project in Freeborn County will generate $30.9 million in economic activity. This includes $13.6 million in labor income impacts. The project will support an estimated 319 jobs in the county during construction. Of these jobs, 204 will be on-site. The remaining 115 jobs will be at businesses across all industries, such as real estate, health care, and professional services.

**Table 2: Economic Impact of Proposed Freeborn County Solar Energy Project, Construction, 2022-2023**

| | Total | Freeborn County Economic Impact | | |
|---|---|---|---|---|
| | | Output (Millions) | Employment | Labor Income (Millions) |
| Total investment | $128.8 | | | |
| Direct | | $15.6 | 204 | $7.9 |
| Indirect | | $10.2 | 75 | $4.1 |
| Induced | | $5.1 | 40 | $1.6 |
| **Total** | | **$30.9** | **319** | **$13.6** |

Source: University of Minnesota Extension estimates

## Minnesota Effect

Direct spending in Minnesota is anticipated to be higher. This is due to the increased availability of sourcing materials in the state. Directly, Arevon is expected to spend $33.8 million in the state for the project development. Employment and labor income on-site will remain the same.

In total, construction of the proposed solar energy project will generate $92.0 million in economic activity in Minnesota (Table 3). The project will support 509 jobs and $27.5 million in labor income at the state level.

**Table 3: Economic Impact of Proposed Freeborn County Solar Energy Project, Construction, 2022-2023**

| | Total | Minnesota Economic Impact | | |
|---|---|---|---|---|
| | | Output (Millions) | Employment | Labor Income (Millions) |
| Total investment | $128.8 | | | |
| Direct | | $33.8 | 204 | $7.9 |
| Indirect | | $48.1 | 240 | $16.1 |
| Induced | | $10.1 | 65 | $3.5 |
| **Total** | | **$92.0** | **509** | **$27.5** |

Source: University of Minnesota Extension estimates

In general, the larger the study area, the higher the economic impact. A larger economy has fewer leakages. Leakages occur when the company or its employees make purchases outside the study area. When this happens, indirect and induced effects are not generated.

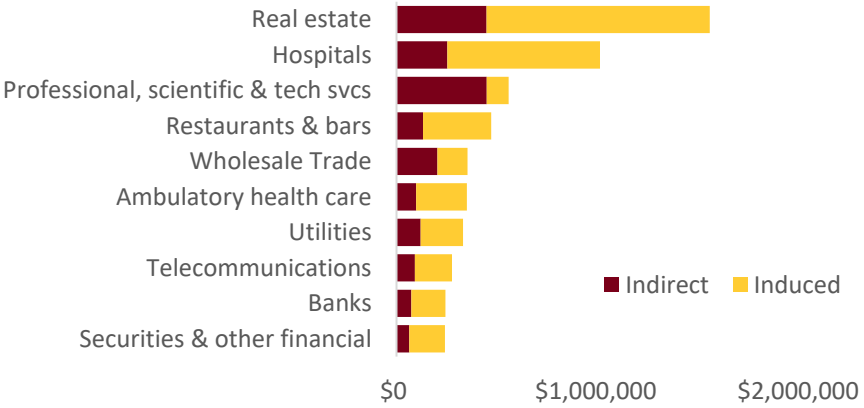
## Top Industries Affected

The top industries benefiting from the project's construction in Freeborn County include real estate, hospitals, and professional, scientific, and technical services (Chart 3).

Indirect, or business-to-business effects, are highest in professional, scientific, and technical services, real estate, and health care. For example, professional service impacts might include ripple effects related to the project engineering. Another example of indirect effects would be in the real estate sector, as the companies hired to do the work pay rent or a mortgage on their buildings.

Induced, or consumer-to-business effects, are highest in real estate, hospitals, and restaurants and bars. These industries are also those in which consumers spend the most, so the impacts are not surprising.

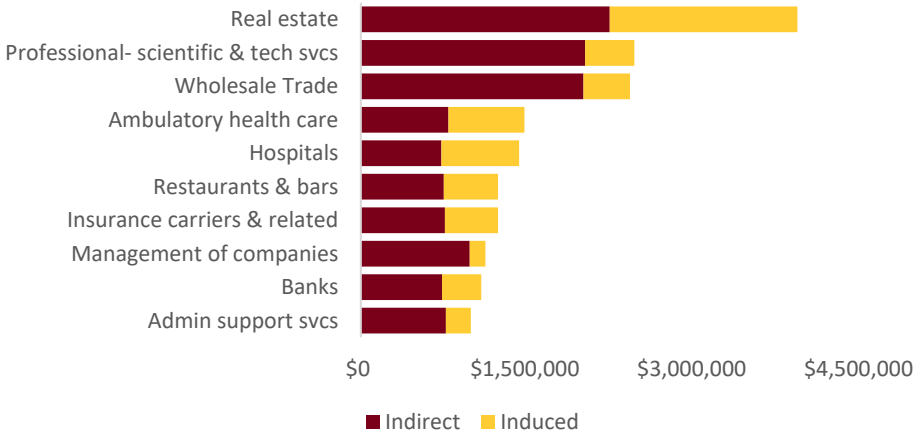
**Chart 3: Top 10 Industries Affected, Proposed Freeborn County Solar Energy Project, Construction 2022-2023, Freeborn County**




Source: Extension and IMPLAN

In Minnesota, the indirect effects are higher. This is partially attributable to the fact that certain supplies needed for project construction can be purchased in Minnesota, but not in Freeborn County. Real estate, professional, scientific, and technical services, and wholesale trade are industries predicted to experience the highest benefits from the project (Chart 4).

**Chart 4: Top 10 Industries Affected, Proposed Freeborn County Solar Energy Project, Construction 2022-2023, Minnesota**




Source: Extension and IMPLAN

### Tax Impacts

Construction will also generate state and local tax revenues. Businesses and households affected by the construction in Freeborn County will generate an estimated $461,870 in state and local taxes between 2022 and 2023 (Table 4). This includes sales, income, and property taxes.

When expanded to include all Minnesota businesses affected by construction spending, the amount of state and local taxes generated from the project increase to an estimated $2.3 million. As with all construction impacts, once the project is complete, these impacts will dissipate.

**Table 4: Tax Impact of Proposed Freeborn County Solar Energy Project, Construction, 2022-2023**

| Tax Category | Freeborn Co. | Minnesota |
|---|---|---|
| Sales | $169,690 | $779,850 |
| Income | $122,840 | $583,180 |
| Property | $113,680 | $634,960 |
| Other | $55,660 | $318,190 |
| **Total** | **$461,870** | **$2,316,180** |

Source: University of Minnesota Extension estimates

## Economic Impact of Operations and Maintenance

### Direct Effect

Once the solar project construction is complete, the project will become operational. The day-to-day running of the facility is known as operations and maintenance (O&M). Arevon anticipates spending $2.2 million annually on O&M (Table 5). The company plans on hiring four employees at the site.

The majority of O&M spending will be within Freeborn County. The largest share of O&M spending will be for land payments, which are essentially rent payments to the owners of the land where the project is sited.[3]

O&M costs in the Table 5 include items such as spare parts and vegetation management. Certain O&M costs (for example, replacement parts) will be sourced outside of the county.

**Table 5: Direct Impact of Proposed Freeborn County Solar Energy Project, Operations and Maintenance**

| | Total | Freeborn County | Minnesota (including Freeborn Co.) |
|---|---|---|---|
| O&M costs | $363,000 | $182,440 | $189,930 |
| Land payments | $1,500,000 | $1,500,000 | $1,500,000 |
| Labor | $332,000 | $332,000 | $332,000 |
| **Total** | **$2,195,000** | **$2,014,440** | **$2,021,930** |

Source: Arevon and University of Minnesota Extension estimates

[3] To model land payments, Extension modeled half the payments as household income (which would assume the landowner spends the money in the same pattern as their household expenses). This would likely apply in situations where the landowner owns the land free and clear. Extension modeled the other half as a real estate/banking transaction, which would assume the landowner is using the income to make loan payments.

## Total Effect

In total, operations and maintenance of the Freeborn County solar project will generate an estimated $3.3 million of economic activity in the county (Table 6). This includes $703,530 in labor income impacts. The project will support 14 jobs. These impacts will be annual, as long as the project operates at projected levels.

**Table 6: Economic Impact of Proposed Freeborn County Solar Energy Project, Operations and Maintenance**

| | Freeborn County Economic Impact | | |
|---|---|---|---|
| | Output (Millions) | Employment | Labor Income (Millions) |
| Direct | $2,014,440 | 4 | $332,000 |
| Indirect | $626,600 | 5 | $159,740 |
| Induced | $702,350 | 5 | $211,790 |
| **Total** | **$3,343,390** | **14** | **$703,530** |

Source: University of Minnesota Extension estimates

In Minnesota, the solar project will create $4.7 million in economic activity (Table 7). Included in this total is $1.1 million in income to Minnesota residents. The project will support 21 jobs in the state.

**Table 7: Economic Impact of Proposed Freeborn County Solar Energy Project, Operations and Maintenance**

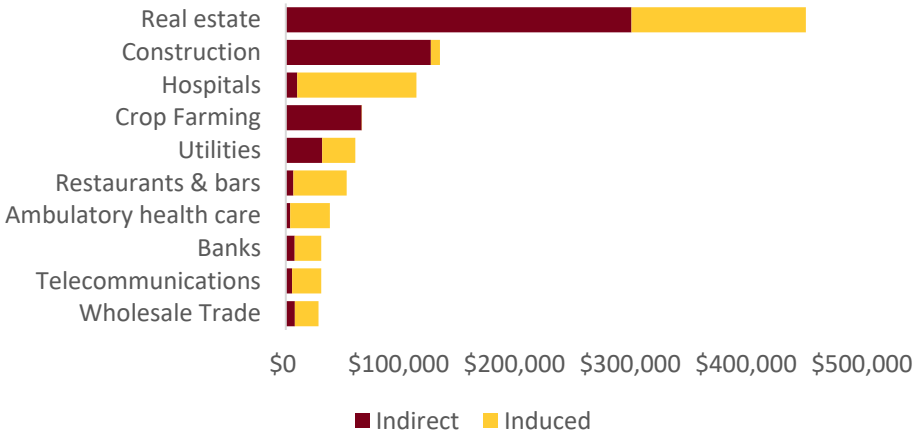
| | Minnesota Economic Impact | | |
|---|---|---|---|
| | Output (Millions) | Employment | Labor Income (Millions) |
| Direct | $2,021,930 | 4 | $332,000 |
| Indirect | $1,312,130 | 8 | $328,450 |
| Induced | $1,373,270 | 9 | $474,460 |
| **Total** | **$4,707,330** | **21** | **$1,134,910** |

Source: University of Minnesota Extension estimates

## Top Industries Affected

The project is expected to create $3.3 million in economic activity. Of this, $2.0 million will be at the solar energy project site. The remaining $1.3 million will be across a variety of industries in the county. Industries experiencing the largest economic benefit from operations and maintenance of the facility include real estate, construction, and hospitals (Chart 5).

**Chart 5: Top 10 Industries Affected, Proposed Freeborn County Solar Energy Project, Operation and Maintenance, Freeborn County**

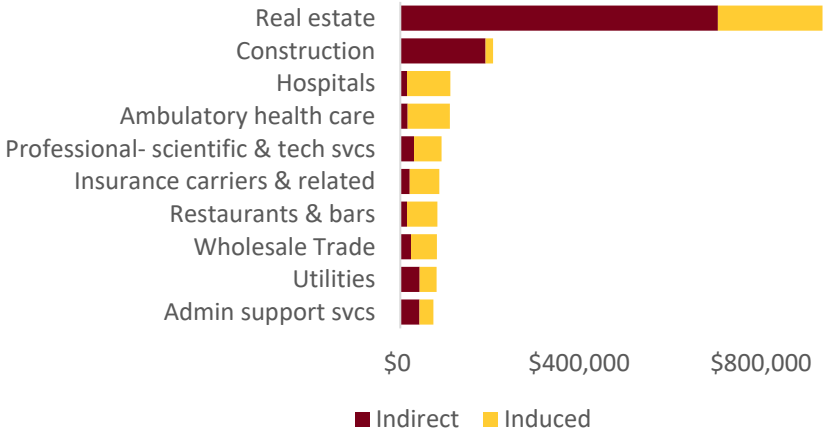



Source: Extension and IMPLAN

Indirect effects are highest in real estate, construction, and crop farming. These correspond with major expenses—real estate generated by the land payments, construction related to the site maintenance, and crop farming associated with vegetation management. Induced effects are higher in industries that support workers—among them health care and restaurants and bars.

In Minnesota, the top industries impacted are similar; however, the total impacts are greater (Chart 6).

**Chart 6: Top 10 Industries Affected, Proposed Freeborn County Solar Energy Project, Operation and Maintenance, Minnesota**




Source: Extension and IMPLAN

## Tax Impacts

Finally, operations and maintenance will generate tax revenues. Businesses and households affected in Freeborn County will generate an estimated $99,040 in revenues (Table 8).

**Table 8: Tax Impact of Proposed Freeborn County Solar Energy Project, Operations and Maintenance**

| Tax Category | Freeborn Co. | Minnesota |
|---|---|---|
| Sales | $47,150 | $61,070 |
| Income | $10,480 | $24,050 |
| Property | $31,200 | $49,420 |
| Other | $10,210 | $22,210 |
| **Total** | **$99,040** | **$156,750** |

Source: University of Minnesota Extension estimates

## Impact in the Context of the Economy

Businesses and enterprises in Freeborn County generated $3.6 billion of output in 2017. Industries with the highest share of output included manufacturing, professional and business services, and agriculture and forestry (Chart 7).

The project is projected to increase economic activity in the construction, health care, and real estate sectors. Thus, the project could help further develop industries in the county.

**Chart 7: Output by Industry, Freeborn County**


Source: IMPLAN

## APPENDIX: METHODS AND TERMS

Special models, called input-output models, exist to conduct economic impact analysis. There are several input-output models available. IMPLAN (IMpact Analysis for PLANning) is one such model. Many economists use IMPLAN for economic impact analysis because it can measure output and employment impacts, is available on a county-by-county basis, and is flexible for the user. IMPLAN has some limitations and qualifications, but it is one of the best tools available to economists for input-output modeling. Understanding the IMPLAN tool, its capabilities, and its limitations helps ensure the best results from the model.

One of the most critical aspects of understanding economic impact analysis is the distinction between the local and non-local economy. The local economy is identified as part of the model-building process. Either the group requesting the study or the analyst defines the local area. Typically, the study area (the local economy) is a county or a group of counties that share economic linkages. In this analysis, there are two study areas—Freeborn County and Minnesota.

A few definitions are essential to properly read the results of an IMPLAN analysis. These terms and their definitions are provided below.

### Output

Output is the quantity of goods or services produced in a given time period by a firm, industry, or county, whether consumed or used for further production. The concept of national output is essential in the field of macroeconomics.

Output represents the value of industry production. In IMPLAN, these are annual production estimates for the year of the data set and are listed in producer prices. Output is measured in dollars and is equivalent to total sales.

### Employment

Employment includes full- and part-time workers, as well as seasonal workers. Employment is measured in annual average jobs, not full-time equivalents (FTEs). IMPLAN includes total wage and salaried employees, as well as the self-employed, in employment estimates. Because employment is measured in jobs and not in dollar values, it tends to be a very stable metric.

### Labor Income

Labor income includes all forms of employment income, including employee compensation (wages, salaries, and benefits) and proprietor income. Labor income measures the value added to the product by the labor component.

### Direct Impact

Direct impact is equivalent to the initial activity in the economy. In this study, it is the expenditures by Arevon and its project partners.

### Indirect Impact

The indirect impact is the summation of changes in the local economy that occur due to spending for inputs (goods and services) by the industry or industries directly impacted. For instance, if employment in a manufacturing plant increases by 100 jobs, this implies a corresponding increase

in output by the plant. As the plant increases output, it must also purchase more inputs, such as electricity, steel, and equipment. As the plant increases its purchase of these items, its suppliers must also increase production, and so forth. As these ripples move through the economy, they can be captured and measured. Ripples related to the purchase of goods and services are indirect impacts.

## Induced Impact

The induced impact is the summation of changes in the local economy that occur due to spending by labor; that is, spending by employees in the industry or industries directly impacted. For instance, if employment in a manufacturing plant increases by 100 jobs, the new employees will have more money to purchase housing, buy groceries, and go out to dinner. As they spend their new income, more activity occurs in the local economy. This can be quantified and is called the induced impact.

## Input-Output, Supply and Demand, and Size of Market

Care must be taken when using regional input-output models to ensure they are being used in the appropriate type of analysis. If input-output models are used to examine the impact or the contribution of an industry that is so large that its expansion or contraction results in such major shifts in supply and demand that prices of inputs and labor change, input-output can overstate the impacts or contributions. While this project is a significant investment in Minnesota, it should not affect pricing.

## Operations and Maintenance (O&M)

Arevon provided Extension with its projected O&M budget. In order to model this in IMPLAN, Extension needed a more detailed breakdown of costs. To obtain this information, Extension relied on the National Renewable Energy Laboratory's Jobs and Economic Development Impact (JEDI) model. The JEDI model is built on known data for solar energy projects and provides a detailed accounting of expenditures that can be entered into IMPLAN.

## Analysis by Parts

Analysis by parts (ABP) is an IMPLAN modeling technique. ABP allows the analyst to enter each expenditure as its own category, as opposed to relying on a standard production function. Standard production functions are built into IMPLAN. For well-established industries with companies that follow a similar spending pattern, the production functions provide accurate estimates of spending. However, for developing industries or industries comprised of companies with differing spending patterns, analysis by parts provides a more accurate estimate, since the analyst enters spending data directly. Extension used ABP for this analysis.